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ABSTRACT

A description is given of the development and application of contingency management (CM) techniques to the educational performance of a broad cross section of adult, male prison inmates. By most standards, these inmates are judged to be at the lowest rung of the motivational ladder. Draper Correctional Center experimental and demonstration projects were begun in 1961 to provide basic education through the use of programmed instruction (PI). To modify the operation of the self instructional school, an Individually Prescribed Instructional System was created, and effective CM procedures were developed. CM procedures were also applied to vocational training at Draper in the Manpower Development and Training Programs. Six studies made of the use of CM in the Draper program show that the materials and techniques that have been successfully employed fall into two categories: the contingency or performance contract, and progress plotters. Results of the studies clearly indicate that performance-contingent pay to trainees is significantly superior in getting efficient and effective learning in both basic education and vocational programs. (Pages 12 through 14 of the original document, which are examples of CM devices and forms, are copyrighted and are not available from EDRS.) (DB)

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THE USE OF CONTINGENCY MANAGEMENT TO AFFECT LEARNING PERFORMANCE IN ADULT INSTITUTIONALIZED OFFENDERS[1]

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In recent years, behavior science has made substantial contributions to problems of motivation. By providing effective tools to generate and maintain desirable behavior in many population groups, it has facilitated the efficiency with which those of us who have responsibilities for guiding, teaching, or directing the work of others can achieve our objectives. One of these motivational tools is called *contingency management* (CM). The term "CM," defined as the *systematic arrangement of reinforcing consequences of behavior*, is usually restricted to educational settings where the objective is to achieve increased student performance by manipulating the *contingencies of reinforcement* (Skinner, 1970). Homme et al. (1968) restricts the meaning of CM to that of managing or controlling the relationship of behavior and the consequences (reinforcing events) that follow it. According to their definition, the stimulus that controls the emission of behavior is not in the domain of CM. They illustrate the concept by the following paradigm:

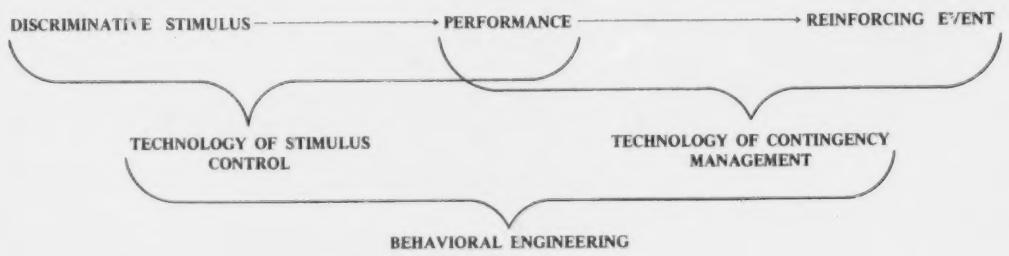

Fig. 1. Relationships between the three-term contingency and behavioral engineering (Homme, et al.).

In actual practice, however, few experimenters can separate stimulus control variables and deal exclusively with the right side of the operant paradigm. Such has been the case in the Draper CM studies. In fact, variables that are manipulated by the contingency

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manager in educational settings are usually quite complex and seldom pure or refined enough to be classified as one contingency without serving as another at the same time. For example, the *contingency* or *performance contract* is a favorite and quite useful instrument of the contingency manager. Its principal value lies in the fact that it can provide effective stimulus control over very complex behavior over a long period of time. Yet, the reinforcing consequence of contract completion puts it into the reinforcing event category.

Purpose of this Paper

The purpose of this paper is to describe the development and application of CM techniques to the educational performance of a broad cross section of adult, male prison inmates who, by most standards, are judged to be at the lowest rung of the motivational ladder. It is a population group that has been genuinely "turned off" by public education, which has always dealt them constant failure and rebuff, resulting in a mutual hostility and an avoidance of contact.

This same group of men have failed in more than education: they have failed in every major undertaking of their lives, including crime! But, since they are a success-deprived group, they continue to seek reinforcers in areas where they have been punished, including education, relationships with authority figures, and family relations. Needless to say, the typical prison provides few opportunities to gain these reinforcers.

Draper Experimental Projects Begin

Draper experimental and demonstration projects began in 1961. The focus was on providing quick and easy success in basic education through the use of programmed instruction (PI). Through a grant from NIMH in 1962, a "self-instructional school" was established in which PI materials comprised 95 percent of the curriculum. Reinforcers used to maintain learning behavior were largely social–staff approval, inspirational talks, visitors from the "free world," and student success.

Need for Changes in PI Recognized

Experience with PI soon generated questions on how to modify the operation of the self-instructional school. Two basic questions evolved: (1) How to more effectively tailor PI to meet individual deficiencies and (2) how better to generate high levels of student performance. Response to the first of these needs resulted in the creation of an

Individually Prescribed Instructional (IPI) System. The second need led to the development of effective contingency management procedures.

One of the five major operations within the IPI System for basic education is managing the contingencies of reinforcement. Other key operations in the system are:

- Establishing learning objectives
- Diagnosing the learner's relevant entry skills
- Prescribing modules of materials in the sequence the learner needs to attain his objectives or to remedy his deficiencies

  and
- Evaluating the learner's progress

After the student's learning objectives have been established, his deficiencies have been diagnosed, and his prescription has been developed, the student begins his assignments in weekly segments. As many segments or units are listed on the prescription as are required to bring the student up to a desired grade average in all areas shown on a standardized achievement test. Each segment of work consists of what a student can be expected to accomplish in a given period of time. This unit of work is put into the form of a "contingency contract" which the student is expected to complete before the end of the week. If he finishes sooner than the estimated number of hours, he can accept another contract. The contingency contract requires a progress test for each module, and the student must score 85 percent or better on all module tests. Scores below 85 necessitate the student being assigned an alternate module and its corresponding test.

CM procedures used within the IPI System at Draper have demonstrated considerable effectiveness as a means of increasing efficiency in learning basic education skills.

The EMLC

In 1968, the Department of Labor established at Draper an Experimental Manpower Laboratory for Corrections (EMLC) operated by the Foundation. The purpose of the Lab was to conduct long-range research studies in correctional rehabilitation as it pertains to manpower training--getting prisoners prepared for jobs in the free world, getting them out and employed and keeping them in jobs. To accomplish these objectives, the Lab researches on a wide range of problems. In addition, the Lab is seeking to perfect certain training systems in both basic education and vocational training. Developing an effective learning model has demanded that considerable effort be spent on motivational research, with the point being that efficiency in learning is in high demand for prison inmates

who must quickly make up for a lot of educational time in order to compete effectively in the job market.

Draper Studies in Contingency Management

1. Clark's Study (1966)

The first CM experiment at Draper was conducted by Hewitt Clark. He selected just two inmate subjects and attempted to increase their educational performance. Using a "reinforcing event menu (Homme, 1966)" listing high probability behaviors (Premack, 1965), Clark demonstrated that inmate learners could substantially increase their performance over their baseline measurements.

Both *S*s more than doubled their frame (PI) output during the CM phase (see Figure 2 and Figure 3), as compared to baseline performance. Although significantly more tests were taken, test scores did not drop during the increased performance period.

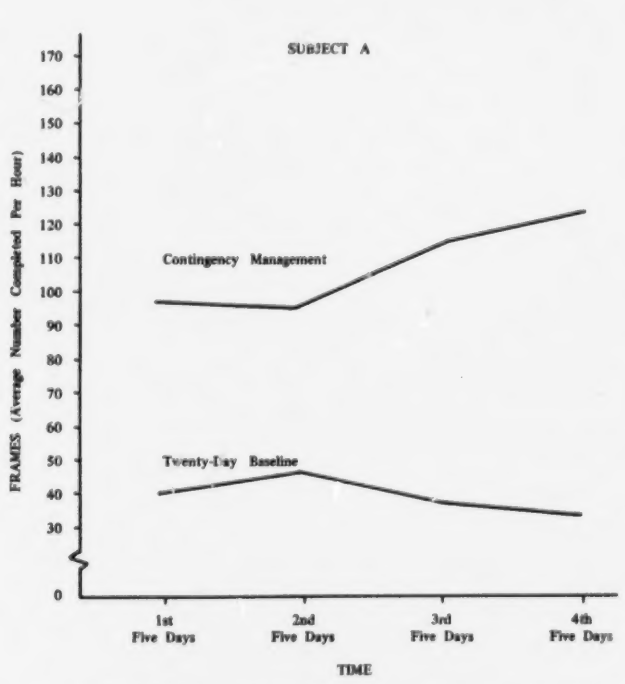

Fig. 2. Comparison of performance during baseline and contingency management conditions.

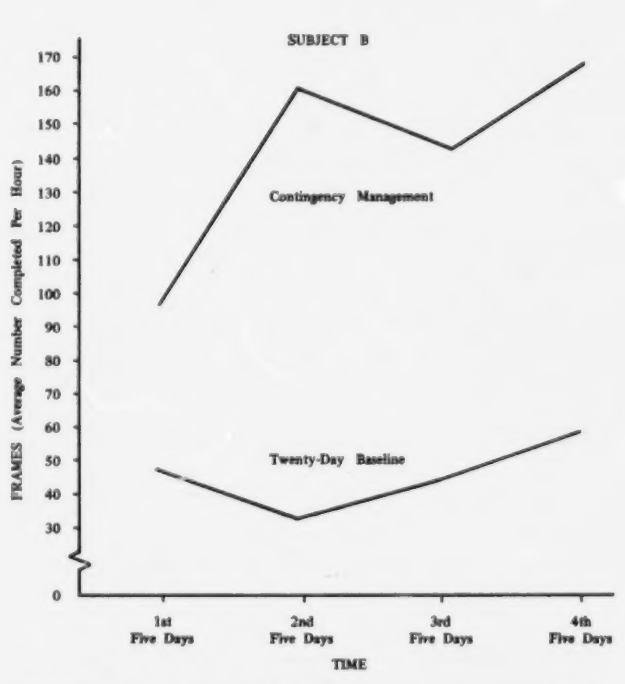

Fig. 3. Comparison of performance during baseline and contingency management conditions.

2. Clements and McKee (1968)

This study was designed in three phases. Subjects were 16 inmate volunteers ranging from 17 to 35 years of age and from 7 to 12 grades in academic achievement level. The environment for the study included a learning area and a reinforcing event (RE) area in separate rooms. Phase I was a three-week baseline period during which quantity and quality baseline measures of academic "productivity" were established.

In Phase II, the contingencies of reinforcement were managed by the experimenter. During each of the four weeks of this phase, a performance contract was used which specified that the subject's daily output would be approximately 20 percent greater than his average daily output during the immediately preceding week; such increases had been previously agreed to by each subject. Upon completing a specified segment of work (e.g., a number of frames), the subject was allowed a 15-minute RE period. In Phase III, a two-week self-management phase, each subject specified the amount of work he would do each day, the only limitation being that he contract for an output equal to or greater than his daily average under baseline conditions. During all phases of the study, subjects were required to pass final exams on each programmed course before they could continue with new material.

The table below summarizes the performance over the six weeks of the experimental phases of the study.

TABLE 1

Summary of Performance Over Six Weeks

	Baseline (Phase 1)	E-management (Phase 2)				Self-management (Phase 3)	
	(3-wk. average)	1	2	3	4	5	6
Hours per day per man*	5.3	4.7	4.4	4.5	3.8	3.5	3.3
Frames per hour	61	77	92	102	134	125	126
% tests passed	71	70	88	70	90	81	85
Number of *S*s	16	16	16	16	14†	13‡	13

*Includes RE periods, testing, reviews, etc.; 6 *S*s were half-day students (a.m. or p.m. only).
†One *S* dropped by request; one *S* released from prison.
‡One *S* dropped by request.

The increase for the last three weeks of Phase II averaged about 14 percent in frames per hour, but the increase in test taking, resulting from the increase in number of frames, brought the task-oriented activity approximately to the proposed 20 percent increase. Though the frames per hour decreased from the experimenter-managed phase to the self-managed phase, the subjects' productivity remained well above the established minimum. The results support the hypothesis that contingency management techniques

can increase the productivity levels of offenders studying programmed materials. Additionally, subjects can manage their own learning behavior. The implication that more was learned per unit of time is further supported by the superiority of test results during the experimental phases: an increase in the quantity without sacrificing quality.

3. Enslen's Study (1969)

Visible daily progress charts and monetary rewards for increased work were used in an attempt to increase the productivity of 11 prison inmates who studied programmed instruction. Each subject in the experiment agreed to fill out accurately his individual progress chart at the end of each day. All test scores were recorded, and completed units were represented by coloring a portion of a bar graph. Small amounts of money were awarded to those students who continued to perform outstanding work over a prolonged period. During the period in which the charts were used and the money was presented, there resulted a marked increase in the academic progress and output of the subjects as compared to both the baseline phase and post-chart phase.

During the CM phase, there was a slight increase in the number of tests passed, but a substantial increase in number of tests taken (see Figure 4). This merely reflects the fact that the subject covered a great deal more PI material in the same period of time. The average grade level for the 15 weeks of the experiment increased from 7.1 to 8.9 for the 11 *S*s, an average gain of 1.8 grades for each *S*.

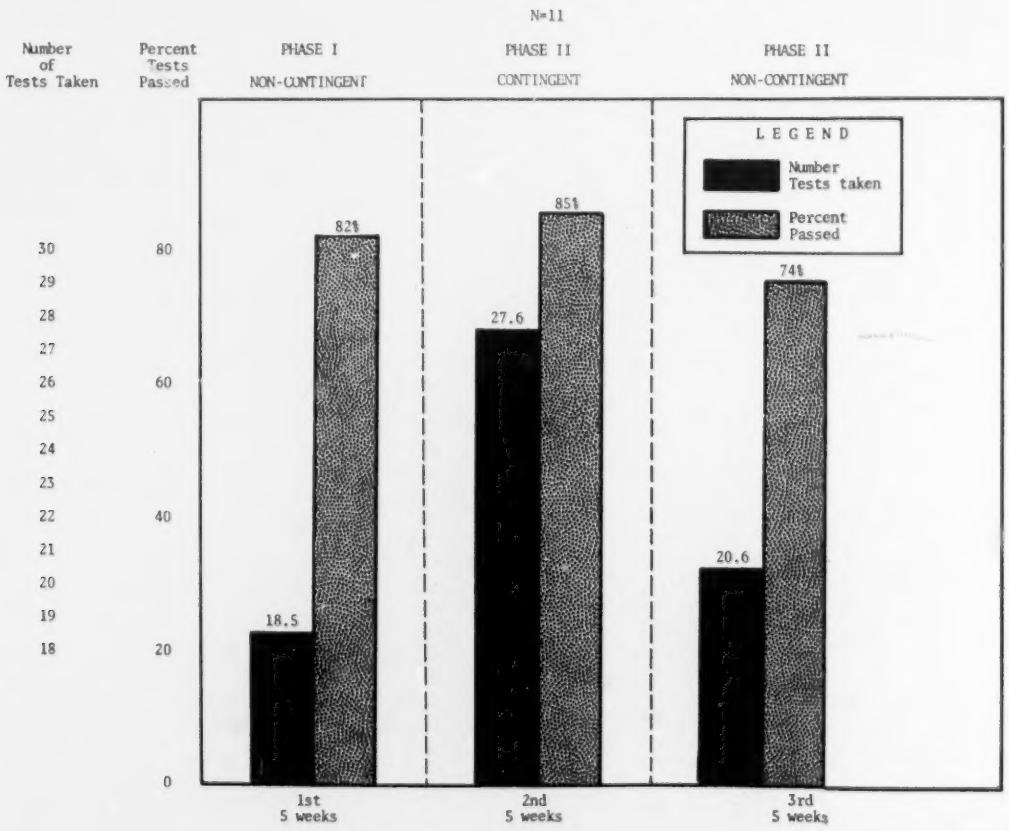

Fig. 4. Number of tests and percentage passed by phases for all Ss.

4. Jenkins et al. (1969)

Another study, seeking to determine the relationship between learning performance and contingent money payments, addressed itself to the question, "Does the removal of a strong reinforcer contingent upon a student's behavior result in a decrease in desired performance levels?"

Twenty-three trainees in Draper's MDT program were subjects of this twenty-week experiment. In Phase I of the experiment, money payments were contingent upon the trainees' learning performance as measured by (1) number of tests taken and (2) percentage of tests passed. Trainees received $10 each week for satisfactory performance and were penalized at a rate not exceeding $2 per day for unsatisfactory performance.

During Phase II, the last ten weeks, money payments were *not contingent* upon learning performance. Money payments were continued at the $10-per-week rate as in Phase I, whether performance was satisfactory or not.

Results indicated that 21 of the 23 *S*s did not perform as well when money payments were no longer contingent upon their performance. The percentage of tests passed dropped markedly in Phase II, while the number of tests taken did not change (see Figure 5).

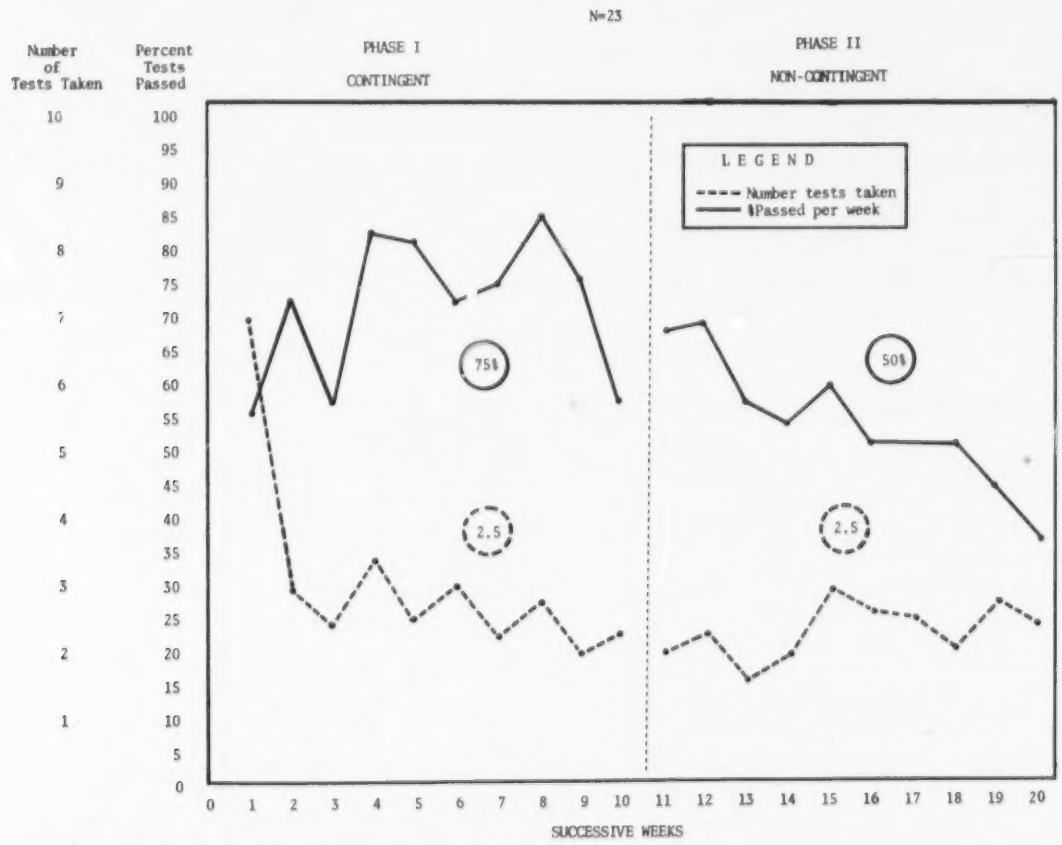

Fig. 5. Number of tests taken and percentage passed per week for all Ss.

5. Recent Studies

a. The Effect of CM Procedures on the Rate of Learning (McKee, 1971)

Few if any studies have been conducted to determine the relationship between certain well-accepted learning variables as they interact with CM conditions. It seemed important, therefore, to study the interactions of learning rates, academic achievement scores, and I.Q. under controls afforded by PI and the procedures of CM.

Subjects for this study included not only 40 prison inmates from Draper but also 21 freshmen nursing students from Tuskegee Institute in Alabama who scored below the admission cutoff score on entrance tests and would not have been allowed to enter the nursing school were it not for a new academic upgrading. The mean grade-level achievement score initially for the prison inmates was 7.8; for the nurses, it was 10.5. For both groups the IPI System provided the stimulus materials and the process for obtaining the learning rates of the subjects.

The study compared the actual times which students took to complete the various modules with the predetermined estimated times, allowing for a cumulative record of individual learning rates. Learning rates were then analyzed to find out their relationships to initial reading level, initial grade level, final grade level, grade level change, and I.Q.

Data collected from this study indicate a number of interesting and noteworthy conclusions. Analysis showed that grade level change does not correlate even moderately with other measures (i.e., initial reading level, initial grade level, etc.). The extent to which a student may change his grade level appears independent of initial as well as terminal grade levels. This finding is consistent in both the prison inmate group and the nursing student group.

Perhaps the most significant outcome of this study was that of obtaining stable rates of learning in academic subject matter and over a relatively long period of time. Motivation, provided by contingency management procedures, was maintained at a consistent, if not optimum, level.

The arrangements and conditions of the study permitted reliable and valid correlation of learning rates with certain measures that traditionally were thought to be functionally related. For example, I.Q., reading skill, and academic achievement are measures that many educators maintain, in commonsense fashion, have a significant influence upon learning rate. But, it is interesting to note that two quite different

samples–prisoners and college students–yielded similar results; according to the data, there is little cause and effect relationship in the idea that I.Q. is a cause of slow learning.

Figure 6 depicts three representative samples of high, medium, and low prison learners, as shown by cumulative records for three prison inmates. Both samples of prison and nursing student subjects were fairly evenly distributed among the three groups, though the nursing students showed generally higher learning rates. Interesting, too, was the finding that stable learning rates were exhibited by all learners, with the exception of three *S*s, who showed an occasional acceleration or deceleration in their cumulative records.

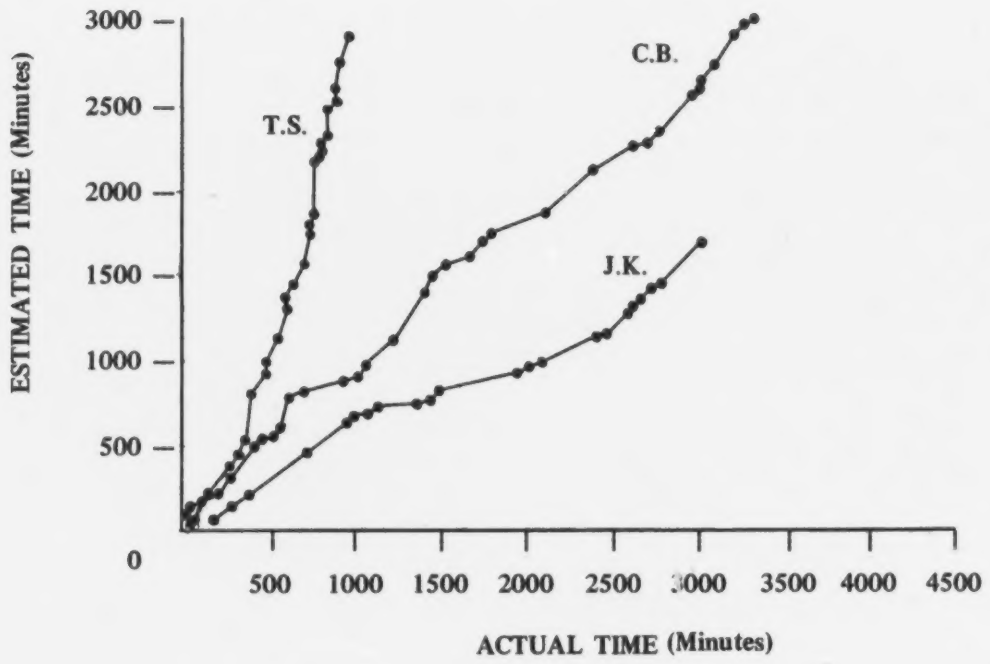

Fig. 6. Cumulative record of estimated and actual times by modules (representative records of three prison inmates).

Other Relevant Data

CM procedures have also been applied to vocational training at Draper in the MDT project. Courses in welding, refrigeration repair, barbering, and butchering have been broken down into small tasks (modules) and time required for their completion has been empirically derived from trainees going through the course. Large segments of study were then made self-instructional. Contracts, then, were written with point value for completion of the modules to a specified criterion. The backup reinforcer for these points was money.

The results of this individualizing shop training were twofold. First, trainees could proceed at their own rate through self-instructional modules, permitting an open-entry/open-exit training program. Second, trainees finished all required work without sacrifice of training quality much sooner than anticipated. The result was that the MDT project trained 30 percent more trainees than were contracted for. A new project is scheduled to start soon at Draper, and the Lab proposes to train 52 percent more students than the present program agreed to train.

Specific CM Techniques Employed by the Draper Project

The contingency management materials and techniques that have been successfully employed by the Draper projects fall into two categories: the *contingency* or *performance contract* and *progress plotters*. The contract, aside from apparently being an effective stimulus control, permits the manager to administer *points* contingent upon contract performance and completion. These points usually have a "cash-in" value (backup reinforcers) of either money, other tangible reinforcers, or privileges. Attached to this paper are examples of CM devices and forms that are employed by the Draper MDT Project. Each is self-explanatory.

Impact

The studies presented in this paper sought to answer two important questions. The first is a theoretical one: Does the systematic arrangement of positive consequences for educational behavior (CM) significantly increase *S*'s performance? The second question is quite important from the standpoint of public policy: If the answer to the first question is positive, what implications does it hold for the awarding of "incentive allowances" to trainees in prison Manpower Development and Training programs? At present, prisoners receiving manpower training are paid allowances on a time-contingent basis. The results of the studies cited in this paper clearly show that performance-contingent pay to trainees is significantly superior in getting efficient and effective learning in both basic education and vocational programs.

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